

THRASHER (A.B.)
Compliments of the Author.

THE EFFECT OF
INTRA-NASAL OBSTRUCTIONS
ON THE
SINGING VOICE.

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A. B. THRASHER, A.M., M.D.,
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A Paper accepted as a Candidate's Thesis for
Membership in the American Laryn-
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THE EFFECT OF INTRA-NASAL OBSTRUCTIONS ON THE SINGING-VOICE:

WITH REPORTS OF CASES.

BY A. B. THRASHER, A.M., M.D.,
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While the voice has its origin in the larynx, yet not all disorders of this function are caused by intra-laryngeal lesions. The influence of the resonant chambers in the naso-pharynx and nares in modifying the primal vibration must not be underestimated. The over-tones originating in these cavities exert a powerful influence on the timbre of the singing-voice, as can readily be demonstrated by noting the changes in the same voice under different conditions of these parts.

MacDonald (¹) says that intra-nasal obstruction influences the vibration and pitch of the voice. He has operated on these obstructions, and in every case has had a satisfactory improvement of the singing-voice. From the results obtained in these cases he thinks that a removal of post-nasal obstructions raises the pitch of the voice; while enlarging the space in a stenosed nasal fossa improves the timbre. Dr. F. W. Hinkle (²) says that he has noted a gain in brilliancy and compass after removing a nasal obstruction. In one case there was a gain of a minor third in the upper register.

These observations do not prove that sound-waves pass out through the nares, but that the tone-wave passing out through the mouth is reinforced or modified by the vibration in the chambers above the velum palati. Kofler (³) has proven that the so-called nasal voice is not caused by mere occlusion of the nose. He says that, while hidden by a screen, he sang a number of tones in

regular succession, some with the nose closed by the fingers and others with the nose open, and no one could tell in which manner the tones were produced. I have had this experiment repeatedly verified by different singers under my treatment.

There is a radical difference of opinion as to how the sound-waves from above the soft palate pass to the primal waves below. Garcia, Browne and Behnke⁽⁴⁾, and others, place great reliance on Czermak's experiment, which they think conclusively proves that the soft palate actually touches the back wall of the pharynx, completely shutting off the lower throat from the nose. Under these conditions the vibration from above must be transmitted through the soft palate. Browne and Behnke state: "If we raise the soft palate, thereby shutting the nose off from the throat, then the tone passes through the mouth, and assuming that its exit takes place in a normal manner, it will be a pure vocal tone. If we

lower the soft palate, thereby shutting the mouth off from the throat, then the tone passes through the nose, which gives it a nasal quality." Then they give the hand-mirror experiment, which they claim settles the matter. Yet, neither of these experiments prove the exact position of the soft palate. When water is thrown into the naso-pharynx, as in Czermak's experiment, it causes a reflex contraction of the levator palati muscles with a tendency to shut off the nose from the throat, so that the position of the velum, with a fluid pressing on its upper surface, could not be taken as positive proof of its position in normal tone production.

The mirror held against the upper lip only proves that when producing a nasal tone the air may pass through the nose; that it does not require the passage of the tone through the nose to make a nasal voice is easily proven by simply holding the nose so as to prevent the air from going through the passages, when the nasal tone can be

as easily given. And it proves that in the production of a pure tone the air does not pass through the nose, a proposition which is not disputed, but it proves nothing in reference to the position of the soft palate in pure tone production. It can be easily demonstrated that nasal tones are produced by a low position of the velum, and by directing the laryngeal sounds back of the soft palate instead of out through the mouth. But the question still arises, can the vibrating column of air be all directed out of the mouth while there is yet a sufficient space between the posterior pharyngeal wall and the soft palate to allow of a communication of vibratory motion between the air in the pharynx above and below the soft palate?

The subjective sensation of singers can, I think, not be relied upon. I asked six intelligent singing-masters as to the position of the soft palate, and four answered that its proper position was against the pharynx, closing the opening into the nose, and two thought

that there must be a small space for the passage of vibration. My own experiments with warm water thrown gently through the nose into the naso-pharynx would indicate that while the water is present the passage is for the most part closed. With a fine curved silver probe introduced through the mouth and passed up behind the soft palate there seemed always to be an opening, smaller during the singing of high tones and growing larger the lower the pitch. Another curious condition was observed: in singing softly the velum palati was drawn more firmly and the opening was smaller than when producing the same notes with a loud voice.

I realize that the presence of a probe renders the condition abnormal, but in the four cases experimented on the throats were accustomed to the foreign body and were not irritable. I am not yet satisfied as to whether there be an open communication between the throat and nose during the production of a musical tone, but I am inclined to think

that there is, otherwise the vibrations must pass through the velum palati, which is a thick muscular curtain, and apparently not well fitted to act as a vibrating medium. Yet, which ever condition exists, there can be no doubt as to the influence of nasal conditions on the voice, or that the resonant chambers above the soft palate largely determine the timbre of the singing-voice.

All singing-masters unite in attaching much importance to exercises of the soft palate, and the tractibility of this muscular curtain largely depends on the condition of the parts immediately above. Bucklin (³) says that he has known a nasal obstruction to seriously injure a singer's voice for twenty years, especially the tones such as "e," requiring a tense velum. Trifiletti (⁴) says that the delivery of the high notes is frequently damaged by a swelling of the nasal mucosa. That an impervious nose from an acute rhinitis impairs the quality of the singing-voice throughout its entire register, more markedly affecting

the upper tones, is well known. Whether the voice is affected before the movements of the velum have been interfered with I can not say, although my own observation of a single case would seem to point that way. Miss S— consulted me one hour before she must sing in a concert. She was just beginning to suffer from an acute rhinitis, and consequently her voice was badly impaired, the upper tones being quite “dead.” The velum seemed to not be involved. After the method of W. C. Glasgow, I opened the engorged sinuses in the turbinates, thoroughly drained the engorged tissues, and used a mildly-astringent spray. She sang with her usual brilliancy, the nares remaining patulous for the rest of the day. Here was a case in which the voice was seriously impaired, and yet there was no gross affection of the palate or any of its movements.

In every chronic rhinitis obstructive in character there is also a consequent impairment of palatal mobility, so that

in these cases two factors enter into the derangement of the vocal function. I have seen a case where the removal of a seemingly innocent hypertrophy has worked a marked benefit to the singing-voice, while on the other hand perhaps the best soprano in the Mississippi Valley has a septal spur pressing against the left lower turbinate.

Bresgen (¹) says that premature exhaustion of voice in practiced vocalists is in many cases due to such diseases of the nose as rhinitis hyperplastica. He cites two cases where female singers had been for some time obliged to abandon the use of the voice on account of exhaustion and loss of control experienced when attempting to sing. The cause of the trouble in these cases Bresgen found to be congestion of the Schneiderian membrane. He thinks the trouble is caused by the mechanical obstruction of the nose and by the impairment of the palatal muscles, the reflex neuroses, so-called, having nothing to do with it.

Michel (¹) thinks that pathological changes in the naso-pharyngeal cavities, even when quite small, can be of the greatest consequence to the singing-voice.

Donnelly (²), of St. Paul, thinks that when from hypertrophy and tumefaction of the turbinates the nasal stenosis is only partial, the voice in the lower register may be fairly good, while there is a marked loss of resonance in the upper register.

When we have present an intranasal obstruction we may expect to find the detrimental effect on the voice exerted in one or more of four ways: (1) By directly or indirectly hindering the movements of the soft palate; (2) by affecting the sound-waves in the naso-pharynx which reinforce the primal laryngeal wave; (3) by causing mouth-breathing, with the consequent impairment of the pharyngeal and laryngeal mucosa; (4) by exerting a reflex action either on the muscles of the larynx or palate.

I consider the first to be by all means the most important factor in affecting the singing-voice. The movements of the velum palati may be affected by the mechanical interference of the obstruction (*e. g.*, a tumor blocking the nasal fossæ and projecting over the soft palate), or by inflammation extending from the obstruction or caused by the irritating secretions flowing backward from the nose (*e. g.*, chronic hypertrophic rhinitis, with the discharge dropping back over the velum).

The second method of injuring the voice affects especially the soft medium register and the head tones, so called. I realize that I am now theorizing with a cause more difficult to prove, but not a less real factor in determining the finer qualities which distinguish a good from a fine voice. A trifling change in the position of the sound-post in a violin will affect its timbre, not by causing any difference in the original sound wave produced by the vibrating string, but a

change in the character of the reinforcing over-tones on which so much of the fine quality of the tone depends. So the spur, or hypertrophy, in the nasal tube may so change the vibration of the entering sound wave as to destroy the sweetness or resonance of certain tones irrespective of the action of the palatal muscles. When the tones are impaired without interference with the movements of the palate it is just as apt to be in the lower as the upper register, while the higher register or the soft medium tones are most affected when there is injury to the movements of the soft palate.

The third method of injury to the voice is perhaps only found in cases of stenosis so complete as to occasion mouth breathing. Donnelly (*op. cit.*) mentions that mouth breathers have more or less pharyngeal and laryngeal inflammation. I have only to refer to Bosworth's⁽¹⁰⁾ very thorough explanation of the physiological function of the nose to prove how irritating mouth breathing is to the

pharynx and larynx. Moses must have been a very accurate observer, or a rhinologist, for he records that the Lord created mankind "and breathed into his nostrils the breath of life," for the breath taken in any other way rapidly becomes the breath of death to the tissues with which it comes in contact.

The fourth method of injury to the voice is not peculiar to obstructions but may be present in any hyperæsthetic intra-nasal lesion. In these cases there is perhaps a neurotic dyscrasia, inherited or acquired, and an affection of the central nervous ganglia, in addition to the irritable spot in the nose. But as there is nothing in a reflex vocal disturbance caused by an obstructive lesion different from any other of the so-called nasal reflexes, I will not further refer to this variety.

I have now given in brief the chief varieties of affections of the singing voice due to intra-nasal lesions of an obstructive character and my theory as

to their method of acting on the voice. I will now give a few reports, the musical notes kindly furnished me by the singing master in charge. The following were noted by Prof. R. P. Southard, of the Cincinnati College of Music:

CASE I.

Mabel S., aged eighteen years. This voice was clear (at time of first lesson), and on all tones below middle "g," but having a peculiar false intonation as if another tone somewhat higher in pitch was being sounded at the same time on all other tones above. The lightness of the upper tones and their quality suggested a mezzo-soprano voice; the lower tones being quite full rather confirmed this view. At this time the range of the voice was from lower "a" to middle "b," anything above being altogether unmanageable, very nasal and generally breaking into "falsetto." Being convinced after a few lessons that an abnormal condition existed in the nose (the throat being clear and healthy), advised treatment. A small septal spur was removed from right naris and hypertrophies of both lower turbinates re-

duced. The accompanying naso-pharyngitis then slowly subsided. The recovery was gradual, but permanent, and the improvement in the voice noticeable almost from lesson to lesson. The improvement in the lower tones of this voice was more marked and rapid than in the upper ones. As the inflammation consequent upon the operations subsided, the voice threw off all semblance to mezzo soprano in quality, and gained very rapidly in compass and volume in the lower tones and in six weeks sang with ease to "f," below; the quality strongly contralto. The growth of the upper portion of the voice, which at time of writing has reached "e," fourth space, has been much more gradual. The most marked improvement in this voice is in its quality, which is rich, full and earnest.

CASE II.

Miss M., aged eighteen years. This voice at time of examination was very thin and weak, of indeterminate character but apparently inclining to mezzo-soprano, the speaking almost altogether "falsetto." What tones the singing voice could command were not unmusical, and the pitch true; the compass

was limited singing only from "f" sharp, below, to middle "a." These tones were sometimes of proper quality and sometimes in "falsetto." There was an inability at all times to produce distinctly the final syllable of words ending in "ing." After treatment the first symptom of any improvement was clearer utterance, particularly of the final syllable in both singing and speaking. There was a chronic hypertrophic rhinitis with tumefaction over both sides of septum. The velum palati was thick and "boggy." The tissues reacted slowly under treatment. As the parts operated upon became normal, and gathered strength, the voice became fuller in the lower tones, and she now sings from "e," below, to "c," third space, or nearly two octaves, with a solid tone quite characteristic of the contralto quality, not as yet strong, but of sufficient loudness to measure its correctness.

CASE III.

Miss M. H., aged eighteen years. This voice at first seemed mezzo-soprano, and ranged from "f," below, up two octaves; all notes above "c," third space, very nasal, accompanied with the false intonation cited in Case I, but in a much

more marked degree. (In this case I removed a large septal shelf from right fossa and reduced posterior hypertrophies of the lower turbinates.) This case is remarkable from the immediate results of the first operation. The patient visited me and took a lesson soon afterwards, and I was very much surprised to find the voice clear and ringing, all false intonation and nasal quality having disappeared; at subsequent lessons, a slightly thickened utterance in speech was noticeable and an effect somewhat as of hoarseness in the singing voice, due, no doubt, to the natural inflammation consequent upon the successive operations. This voice was under my charge about two months when the young lady left the city to attend school. She has lately returned and renewed her studies. I find that the singing voice has made no increase in compass upward, but has gained one tone downward, and has improved very much in quality.

CASE IV.

Miss Blakey S., aged twenty-three. This is the most remarkable example I have known of a voice, distorted and warped, so to speak, all out of shape by

abnormal condition of the nasal passages, being restored to its proper compass, etc., by surgery. On the first trial of this voice what quality it possessed seemed to be mezzo-soprano. No effort was made to establish its upper limit. All the tones above "b," third line, were harsh and disagreeable, a marked characteristic being the false intonation spoken of in previous cases, and the apparent weakness of the lower tones. I cut-off a very hard osseous spur, projecting from the septum and piercing the posterior extremity of lower turbinate; nose and throat otherwise normal. I heard this voice the day following the operation, and was astonished to find the lower tones quite full and mellow. Two days afterwards the speaking voice was actually of a deeper and fuller quality. For the month that this voice remained under my charge, this expansion and increase in volume continued. The upper tones of the singing voice had lost all their harsh and disagreeable quality and their false intonation, and had begun to develop keeping pace with the lower ones. At time of leaving the voice sang from "e" below, to "e" fourth space, two octaves. The voice is naturally large and flexible, and I have no doubt

will eventually sing over a large compass, and the gain being in the upper register.

CASE V.

Mrs. M. R., aged thirty-three. This voice was warped entirely out of shape by false and forced singing, but its contralto character very marked, although it had previously been treated as a soprano, and had so sung for six or seven years. From the first the rasping quality of the upper notes accompanied by the same twanging imperfect intonation as in other cases attracted my attention. A full term of lessons had been taken before the operation was performed and with no special improvement, and for some time after the voice remained stiff and hard, but thereafter began to improve, showing a much more mellow quality in the lower tones, and in a few weeks the upper tones began to show the same relative improvement, the rasping and false intonation disappearing. Here was a chronic naso-pharyngitis with intra-nasal hypertrophy of the lower and middle turbinates. The case responded rather slowly to treatment.

Prof. W. S. Sterling, of the Cincinnati College of Music, has furnished me notes for the following cases:

CASE I.

Mrs. S., aged twenty-five, when first examined had a voice which Prof. S. described as harsh, rough, scratchy, with a range from "c" below to "e" fourth space. She had a small septal shelf and posterior hypertrophies of both lower turbinates with a thick velum and chronic uvulitis. After the removal of the obstructions and the subsidence of the inflammation she sang with a rich, smooth voice from "c" below to "c" above.

CASE II.

Mrs. B., aged twenty-five, had an uneven voice in places, rough, ranging from "a" below to "d" fourth line. There was a marked deficiency in resonance, the upper tones especially being "dead" She had tumefactions over both sides of the septum posteriorly with hypertrophy of right lower and middle turbinates. The natural size of the nasal fossæ was small, hence the obstructions pretty well blocked the nares. The removal of the tumefactions and hyper-

trophies was followed by an increase in the upper register to "g," a gain of three clear notes. The voice is still uncertain, but at most times is fairly resonant, smooth, and flute-like, the gain in timbre being even more marked than in register.

CASE III.

Miss F., aged nineteen, when first examined by Prof. S., had a very thin upper register and no head tones, with a range from "e" below to middle "a." She had large posterior hypertrophies of both lower turbinates, with a mucopurulent post-nasal discharge causing a chronic uvulitis. The removal of these lesions caused a most satisfactory improvement in her voice. Her voice grew smooth, resonant and powerful, while the upper register gained four notes, easily reaching "e," giving her a range of two octaves.

CONCLUSIONS.

1. Intra-nasal obstructions are a common and serious cause of disorders of the singing voice.
2. Generally the obstruction is accompanied by an affection of the soft

palate, and less frequently by pharyngeal and laryngeal disease.

3. When there is simple intra-nasal obstruction not complicated with palatal, pharyngeal, or laryngeal lesions, the timbre only of the voice is affected.

4. When the movements of the soft palate are interfered with then the upper register and the soft medium register are affected, in addition to an injury to the quality of the voice.

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